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IS 8440 (1977): Test code for paddy cleaners [FAD 20:
Agriculture and Food Processing Equipments]

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IS : 8440 - 1977

Indian Standard

"ભારત નિર્દેશ"

"RE-AFFIRMED 1995"

TEST CODE FOR PADDY CLEANERS

UDC 631.362.3 : [633.18.03] : 620.1



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INDIAN STANDARDS INSTITUTION
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

August 1977

Indian Standard

TEST CODE FOR PADDY CLEANERS

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AFDC 42

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AMENDMENT NO. 1 JULY 1983
TO
IS:8440-1977 TEST CODE FOR PADDY CLEANERS

Alterations

(Page 7, clause 8.1.4, line 3) - Substitute
'choking' for 'checking'.

(Page 9, clause 8.2, first sentence) - Substitute
'no load' for 'the rated input capacity'.

(AFDC 42)

Reprography Unit, ISI, New Delhi, India

AMENDMENT NO. 2 JANUARY 1987

TO

:8440-1977 TEST CODE FOR PADDY CLEANERS

(*Page 7, clause 8.1.2, line 3*) - Substitute
'18' for '20'.

(AFDC 63)

Reprography Unit, ISI, New Delhi, India

AMENDMENT NO. 3 FEBRUARY 1997
TO
IS 8440 : 1977 TEST CODE FOR PADDY CLEANERS

(*Page 6, clause 5.1*) — Substitute ‘IS 4333 (Part 1) : 1996*’ for ‘IS : 4333 (Part I) - 1967*’ and the corresponding title in the footnote as ‘*Methods of analysis for foodgrains : Part 1 Refractions (*second revision*)’.

(*Page 7, clause 8.1.3, first sentence*) — Insert the following at the end:
‘and a suitable provisions for a cut off device for under voltage.’

[*Page 13, Appendix C, Sl No. 1(n)*] — Insert the following after ‘(n)’:
‘p) Adequacy of marking to read speed of both main and blower shafts.’

(FAD 51)

Reprography Unit, BIS, New Delhi, India

Indian Standard
TEST CODE FOR PADDY CLEANERS

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 25 April 1977, after the draft finalized by the Agricultural Produce Processing Equipment Sectional Committee had been approved by the Agricultural and Food Products Division Council.

0.2 The freshly harvested paddy often contains chaff, stems, stones, weed seeds, etc. This causes inconvenience in milling and results in poor output. With the modernization of rice milling industry in the country, paddy cleaners are being increasingly manufactured and used. This code is being issued in order to help in objective evaluation of the performance of the paddy cleaners. It is hoped that testing based on this code would help in compilation of data which may be used later for evolving a detailed specification for paddy cleaners.

0.3 In reporting the result of a test made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS : 2-1960*.

1. SCOPE

1.1 This standard prescribes the method for testing of paddy cleaners to evaluate their performance.

2. TERMINOLOGY

2.0 For the purpose of this standard, the following definitions shall apply.

2.1 Aspirator — A component of the paddy cleaner used for cleaning by drawing the air through the paddy mass.

2.2 Blower — A device to produce air blast.

2.3 Clean Paddy — Paddy free from foreign matter.

2.4 Feed Mechanism — The mechanism which regulates the feed rate.

2.5 Feed Rate — The mass of uncleared paddy fed into the inlet of the cleaner per unit of time.

*Rules for rounding off numerical values (*revised*).

2.6 Foreign Matter — It includes inorganic and organic matters. The inorganic matter shall include sand, gravel, dirt, pebbles, stones, lumps of earth, mud and iron chips. The organic matter shall include chaff, straw, weed seeds, dead insects, worms and other inedible grains.

2.7 Lower Screen — The screen for separating finer foreign matter from paddy.

2.8 Magnetic Separator — A device to remove the magnetic materials from the paddy mass.

2.9 Maximum Input Capacity — The maximum feed rate at which no choking occurs in the cleaner and no stalling occurs in the prime mover at the speed specified by the manufacturer.

2.10 Paddy Cleaner — A machine which removes foreign matter from the paddy mass.

2.11 Rated Input Capacity — The feed rate at which the cleaning efficiency is within the specified limit.

2.12 Routine Tests — Tests carried out on each cleaner to check the requirements which are likely to vary during production.

2.13 Scalper — An equipment or screen used for pre-cleaning of paddy mass.

2.14 Screen — The component in the form of perforated or slotted sheet or wire mesh which separates the ingredients of paddy mass on the basis of size.

2.15 Screen Cleaning Mechanism — The mechanism which keeps the perforations of the screen open.

2.16 Screen Slope — The inclination in degrees of the screen with the horizontal.

2.17 Shaking Mechanism — The mechanism which shakes the shoes.

2.18 Shoes — A unit of the paddy cleaner into which the screens are fitted.

2.19 Type Tests — Tests carried out on cleaner to prove conformity with the requirements of relevant standard. These are intended to prove the general qualities and design of a particular type of cleaner.

2.20 Unclean Paddy — The mixture of clean paddy and foreign matter.

2.21 Upper Screen — Screen to eliminate foreign matter bigger than paddy in size. The paddy goes down from upper screen to lower screen.

3. SELECTION AND SPECIFICATION OF CLEANER FOR TYPE TESTS

3.1 Selection — The cleaner shall be taken from the series production by the testing authority with the agreement of the manufacturer.

3.2 Specification — The manufacturer shall supply specification sheet duly filled in as given in Appendix A as well as any further information required to carry out the tests. The manufacturer shall also supply all literature, operational manual and schematic diagram of grain flow in the cleaner. The manufacturer shall also indicate the maximum input capacity and rated input capacity with the foreign matter at 5 percent and 10 percent.

4. TESTS

4.0 Tests as indicated in **4.1** and **4.2** shall be carried out on paddy cleaner.

4.1 Type Tests

4.1.1 General

- a) Checking of specifications (*see 6.1*),
- b) Checking of material (*see 6.2*), and
- c) Visual observations and checking of provisions for adjustments (*see 6.3*).

4.1.2 Test at No-Load

- a) Power consumption (*see 7.1*), and
- b) Visual observations (*see 7.2*).

4.1.3 Test at Load

- a) Short-run tests (*see 8.1*); and
 - i) Visual observations (*see 8.1.5.5*),
 - ii) Cleaning efficiency (*see 8.1.7*),
 - iii) Power consumption (*see 8.1.8*),
 - iv) Rated input capacity (*see 8.1.9*), and
- b) Long-run test (*see 8.2*).

4.2 Routine Tests

- a) Visual observations and checking of provision for adjustments (*see 6.3*), and
- b) Test at no-load (*see 7*).

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5. PRE-TEST OBSERVATIONS

5.1 Determination of Foreign Matter — The foreign matter present in the paddy lot to be cleaned shall be determined in accordance with 3, 4 and 5.2 of IS : 4333 (Part I)-1967*.

5.2 Determination of Moisture — The moisture content of the paddy shall be determined in accordance with IS : 4333 (Part II)-1967†.

5.3 Running-In and Preliminary Adjustment

5.3.1 The paddy cleaner shall be installed on level and preferably on hard surface. All the adjustments shall be made in accordance with manufacturer's recommendations.

5.3.2 The paddy cleaner shall be run-in without load before commencing the tests. The running-in shall be carried out in accordance with the manufacturer's recommendations.

6. GENERAL TESTS

6.1 Checking of Specifications — The specifications given by the manufacturer (see 3.2) shall be checked and reported in the *pro forma* as given in Appendix A.

6.2 Checking of Material — The material of construction of all the components of the cleaner shall be reported in the data sheet given in Appendix B.

6.3 Visual Observations and Checking of Provision for Adjustments — The observations and adjustments given in data sheet in Appendix C shall be made and reported.

7. TEST AT NO-LOAD

7.1 Power Consumption

7.1.1 The paddy cleaner shall be installed on a level and preferably on hard surface. All the adjustments shall be made in accordance with the manufacturer's recommendations. An electric motor of appropriate power, duly fitted with an energymeter, shall be used for running the cleaner.

7.1.2 The cleaner shall be run at no-load for 10 minutes at the specified speed and the readings of the energymeter shall be recorded. The power consumption at no-load shall be calculated.

*Methods of analysis for foodgrains: Part I Refractions.

†Methods of analysis for foodgrains: Part II Moisture.

7.1.3 The data shall be recorded in accordance with Item (1) of data sheet given in Appendix D.

7.2 Visual Observations — During and after completion of power consumption test (*see 7.1*), the observations given in Item (2) of data sheet in Appendix D shall be made visually and recorded.

8. TEST AT LOAD

8.1 Short-Run Tests

8.1.1 The cleaner shall be installed on a level and preferably on hard surface and the clearances and other adjustments shall be made in accordance with the manufacturer's recommendations.

8.1.2 Sufficient quantity of paddy of the same variety having foreign matter (*see 5.1*) not exceeding 10 percent and moisture contents (*see 5.2*) not exceeding 20 percent shall be taken.

8.1.3 The paddy cleaner shall be attached with a suitable prime mover preferably with an electric motor. An energymeter or some form of transmission dynamometer shall be fitted. The power delivered to the cleaner may be supplied in the following ways:

- a) Direct coupling the prime mover with the main axle of the cleaner, and
- b) Connecting the prime mover with the help of flat or V-belt and pulleys with the main axle of the cleaner.

8.1.3.1 In case of (a), the power delivered to the cleaner would be the power output of the prime mover; whereas in case of (b), the allowances for flat and V-belt drive losses may be taken as 6 and 3 percent respectively.

8.1.4 Determination of Maximum Input Capacity — The paddy cleaner shall be initially run for 15 minutes at 90 percent of the maximum input capacity specified by the manufacturer. If no choking occurs, the feed rate should be increased to 100 percent of maximum input capacity specified by the manufacturer. The feed rate should be gradually increased till the stalling of the prime movers and/or choking of the paddy cleaner occurs. The feed rate thus obtained shall be the maximum input capacity for the cleaner. Record the data in the *pro forma* given in Appendix E.

8.1.5 Operation and Collection of Data — The cleaner shall be operated at its specified speed for one hour at a feed rate slightly below the maximum input capacity.

8.1.5.1 During the one hour run, collect the following samples and data:

- a) Three sets of samples at an interval of about 20 minutes at following outlets for quantities indicated against each:
 - 1) Clean paddy outlet 2 kg
 - 2) Foreign matter outlet 0.5 kg
- b) The speed of the main shaft and the readings of the energymeter shall be recorded.

8.1.5.2 At the end of 1 hour feeding, run the cleaner idle for some time, so that practically no more material already fed comes out. At the end of the test, collect and weigh the material dropped through sieve and the grain received at clean grain outlet. The mass of the sample collected at clean grain outlet [see **8.1.5.1** (a)] shall be added to the mass of grain collected after one hour run. If tractor or engine is used as prime mover, the fuel consumed during the run period shall also be recorded.

8.1.5.3 Repeat the test given at **8.1.5**, **8.1.5.1** and **8.1.5.2** for minimum of three times at various feed rates covering approximately 50, 70 and 90 percent of maximum input capacity.

8.1.5.4 Record the data in the data sheet as given in Appendix E.

8.1.5.5 Visual observations—During and after the run tests, inspect the cleaner visually and record the observations in data sheet given in Appendix E.

8.1.6 Preparation and Analysis of Samples—The three sets of samples obtained at the clean grain outlet and the foreign matter outlet [see **8.1.5.1** (a)] for various feed rates shall be thoroughly mixed separately to form a composite sample. Out of these composite samples, 100 g of sample shall be taken and analyzed for the following:

- a) *Main paddy outlet* — To be analyzed for foreign matter.
- b) *Foreign matter outlet* — To be analyzed for clean paddy.

8.1.6.1 Record the data in the data sheet given in Appendix F.

8.1.7 Determination of Cleaning Efficiency—The cleaning efficiency shall be calculated by the following formula:

$$D = 100 \times \frac{E \times (F-G) \times (E-F) \times (1-G)}{F \times (E-G)^2 \times (1-F)}$$

where

- D* = cleaning efficiency in percent,
E = fraction of clean grain at clean grain outlet,
F = fraction of clean grain in feed, and
G = fraction of clean grain at foreign matter outlet.

8.1.7.1 Record the data in the data sheet as given in Appendix G.

8.1.8 Determination of Power Consumption

8.1.8.1 In case of the prime mover fitted with an energymeter the difference between two consecutive readings [see **8.1.5.1** (b)] shall be taken as the power consumption for 20 minutes. Calculate the power consumption per hour giving due allowances to the type of drive (see **8.1.3.1**).

8.1.8.2 In case of the prime mover fitted with a dynamometer the average of the readings shall be taken as the average torque required. Calculate the power requirement by the following formula:

$$\text{Power in kW} = \frac{T \times S}{973.363}$$

where

T = torque in Nm, and

S = speed in rev/min.

8.1.8.3 Record the data in the data sheet as given in Appendix G.

8.1.9 Determination of Rated Input Capacity — Select the feed rate at which the cleaning efficiency shall be not less than 85 percent. The capacity in terms of energy consumed shall be calculated by dividing the capacity by power consumed (see **8.1.8**).

8.1.9.1 Record the data in the data sheet as given in Appendix G.

8.2 Long-Run Test — Operate the cleaner for at least 20 hours at the rated input capacity which should be covered by continuous run of at least 5 hours. Record the major break-downs, defects developed and repairs made into the data sheet given in Appendix H.

9. SUMMARY REPORT

9.1 For the guidance of the user, compile a summary report on the *pro forma* as given in Appendix J.

A P P E N D I X A
(Clauses 3.2 and 6.1)
SPECIFICATION SHEET

To BE FILLED IN BY

Manufacturer Testing Station

1. General:

- a) Make
- b) Model
- c) Type
- d) Year of manufacture

2. Power Unit:

- a) Type of prime mover
- b) Recommended power, kW
- c) Type of drive

3. Main Drive:

- a) Type
- b) Size of belt
- c) Size of pulley
- d) Diameter of main shaft

4. Screens:

- a) Type
- b) Number
- c) Total length and width
- d) Effective length and width
- e) Number of holes per cm²
- f) Size of hole
- g) Sieve clearance
- h) Screen slope range
- j) Recommended screen slope
- k) Provision for screen cleaning

5. Shoes:

- a) Type
- b) Number of strokes per minute
- c) Length of stroke
- d) Number and type of bearings

6. Blower/Aspirator:

- a) Type
- b) Number of blades
- c) Diameter
- d) Recommended speed
- e) Provision for changing air displacement
- f) Drive, if separate

7. Paddy Feeding:

- a) Method of feeding
- b) Size of feeding chute
- c) Discharge height and location of feeding chute
- d) Recommended maximum input capacity
- e) Rated input capacity with 5 percent foreign matter
- f) Rated input capacity with 10 percent foreign matter

8. Transport Arrangements:

- a) Type
- *b) Number of wheels
- *c) Size of wheels
- d) Wheel bearing
- e) Type of towing arrangement

9. Overall Dimensions:

- a) Length
- b) Width
- c) Height
- d) Ground clearance

10. Tools, Accessories and Manuals Provided

NOTE 1 — The item which is not applicable in a particular cleaner should be crossed while filling.

NOTE 2 — If any other items are provided, their details should also be filled in.

*In case wheels are not provided, details of alternative provision shall be given.

A P P E N D I X B
(Clause 6.2)

DATA SHEET FOR MATERIAL OF CONSTRUCTION

1. Date of Test:

2. Material of Construction:

St. No. (1)	COMPONENT (2)	MATERIAL (3)	SIZE (4)	MASS (5)
1.	Frame			
2.	Feeding chute			
3.	Blower/Aspirator			
4.	Main shaft			
5.	Blower Shaft			
6.	Screen			
7.	Shoe			
8.	Elevator			
9.	Transport wheel			
10.	Pulleys			
11.	Others			

NOTE 1 — Delete the component which is not applicable to a particular cleaner and add if any other component is provided.

NOTE 2 — Columns 4 and 5 should be recorded, wherever feasible.

Testing Engineer

A P P E N D I X C
(Clause 6.3)

**DATA SHEET FOR VISUAL OBSERVATIONS AND
PROVISION FOR ADJUSTMENTS**

1. Observations:

- a) Adequacy of marking of inlet and outlets
- b) Adequacy of protection of bearings against the ingress of dust
- c) Adequacy of safety arrangements, specially at moving points and at inlet
- d) Provision for lubrication of moving parts
- e) Provision for belt tightening
- f) Provision for transportation
- g) Provision for easy changing of components requiring frequent replacement
- h) Provision for easy replacement and cleaning of screens
- j) Provision for anti-corrosive coatings
- k) Tightness of bolts, nuts and other fasteners
- m) Welding of seams
- n) Other observations

2. Provision for Adjustments of:

- a) Feed rate
- b) Shaking speed
- c) Screen slope
- d) Air displacement

Testing Engineer.

A P P E N D I X D
(Clauses 7.1.3 and 7.2)

DATA SHEET FOR TEST AT NO-LOAD

1. Power Consumption:

- a) Source of power
- b) Type of drive
- c) Total time of run
- d) Average power consumption for one hour

2. Observations:

- a) Presence of any marked vibration during operation
- b) Presence of undue knocking or rattling sound
- c) Frequent slippage of belts
- d) Smooth running of shafts in their respective bearings
- e) Any marked unusual wear or slackness in any component
- f) Any marked rise in bearing temperature
- g) Other observations

Testing Engineer

A P P E N D I X E
(Clauses 8.1.4, 8.1.5.4 and 8.1.5.5)

DATA SHEET FOR TEST AT LOAD

1. Source of Power
2. Power Rating
3. Type of Drive
4. Variety of Paddy
5. Moisture Content
6. Percentage of Foreign Matter in Paddy Before Feeding
7. Screen Slope
8. Sieve Clearance
9. Air Flow
10. Maximum Input Capacity

11. Test Data*

Sl. No.	DATE	STAR- TING TIME	STOPP- ING TIME	DURA- TION OF OPER- ATION	SPEED (rev/ min)	FEED RATE (q/h)	POWER REQU- RED (kW)	FUEL CONSU- MED (l/h)	No. OF SAM- PLES	QUANTITY (kg) OF SAMPLES FROM		TOTAL QUAN- TITY OF PADDY MIXT- URE AT CLEAN PADDY OUTLET	TOTAL QUAN- TITY OF GRAIN MIXTURE AT CLEAN PADDY OUTLET	Total Flow (kg) (14)
										Clean Paddy Outlet	Foreign Matter Outlet			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)		

*The data should be collected for every test conducted on different feed rates.

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12. *Observation:*

- a) Presence of any marked vibration during operation
- b) Presence of undue knocking or rattling sound
- c) Frequent slippage of belts
- d) Smooth running of shafts in their respective bearings
- e) Frequent clogging of screen perforations
- f) Smooth flowing of material through different components
- g) Vibration free running of fan
- h) Frequent clogging of grain in evator unit
- j) Any marked rise in bearing temperature
- k) Any marked wear, deformation and breakdown
- m) Frequent loosening of fasteners
- n) Other observations (if any)

Testing Engineer

A P P E N D I X F

(Clause 8.1.6.1)

DATA SHEET FOR ANALYSIS OF SAMPLES

SL No.	FEED RATE	SOURCE OF SAMPLE	SAMPLE MASS, g	MASS OF		REMARKS
				Clean Paddy, g	Foreign Matter, g	
(1)	(2)	(3)	(4)	(5)	(6)	(7)
		i) From clean paddy outlet				
		ii) From foreign matter outlet				

NOTE — For different feed rates, use the same *pro forma* as above.

Testing Engineer

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A P P E N D I X G
(Clauses 8.1.7.1, 8.1.8.3 and 8.1.9.1)
**DATA SHEET FOR EFFICIENCY, POWER
REQUIREMENT AND CAPACITIES**

SL No.	ITEM	TESTS No.				
		1	2	3	4	etc
1.	Cleaning unit speed, rev/min					
2.	Feed rate, q/h					
3.	Power required, kW					
4.	Total grain received at clean grain outlet, q					
5.	Cleaning efficiency, percent					
6.	Rated input capacity, q/h					

Testing Engineer

A P P E N D I X H
(Clause 8.2)
DATA SHEET FOR LONG-RUN TEST

1. Total Running Time
2. Continuous Running Time
3. Breakdowns in Cleaning Unit
4. Breakdowns in Elevation Unit
5. Breakdown in Body
6. Any Major Repairs Conducted
7. Any Other Observations

Testing Engineer

A P P E N D I X J
(Clause 9.1)

SUMMARY REPORT

1. Name of Manufacturer
2. Model Number
3. Name of Testing Station
4. Brief Description of the Cleaner
5. Variety of Paddy Used
6. Percentage of Foreign Matter Before Feeding
7. Moisture Content Before Feeding
8. Provisions for Adjustment:
 - a) Shaking speed
 - b) Screen slope
 - c) Air displacement
 - d) Feed rate
9. Power requirement, kW:
 - a) Recommended power
 - b) Observed power at no-load
 - c) Observed power at load at rated input capacity
 - d) Observed power at maximum input capacity
10. Cleaning Efficiency
11. Rated Input Capacity
12. Any Marked Observation Affecting Performance
13. Any Marked Breakdowns
14. Other Observations

Testing Engineer

**INDIAN STANDARDS
ON
AGRICULTURAL PRODUCE PROCESSING EQUIPMENT**

IS:

- 1511-1968 Light duty chaff cutter blades (*first revision*)
1973-1973 Sugarcane crushers (*first revision*)
3939-1966 Hand maize sheller
5718-1970 Test code for air-screen seed cleaners
6983-1973 Rollers and axles for sugarcane crushers
6997-1973 Test code for sugarcane crushers
7051-1973 Power maize shellers
7052-1973 Test code for power maize shellers
7897-1975 Test code for chaff cutter
7898-1975 Manually operated chaff cutter

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